REMARKS

Claims 19 and 28 have been amended in view of the suggestion in the present Office Action by the Examiner to restrict the amount of germanium in the p+ layer to no more than about 1 %. Appreciation is expressed to the Examiner for the suggestion. Entry of the amendment is respectfully requested.

Claims 19-21 and 28-30 have been rejected under 35 U.S.C § 102(e) as anticipated by Wu et al. U.S. Patent No. 6,521,041, hereinafter Wu. Applicants respectfully traverse this rejection for the following reasons.

Wu and the present invention both recognize that silicon can be etches using various etchants. Both recognize that boron doped silicon is an effective substrate for etching, but that such a material has other problems that prevent it from being as commercially viable as would be desired by semiconductor manufacturers and fabricators. Wu solves this problem by reducing or eliminating the high level boron and adding a gradient of germanium to reach a concentration forming an alloy. Wu shows that a silicon and germanium alloy must have at least about eighteen percent (18%) germanium or more in order to be as effective as the high boron doped silicon etch stop.

By contrast, Applicants have left the boron in the silicon and have doped the silicon with about 1%, or preferably 0.5 % to 2.0 %, so that the resulting material is not an alloy of silicon and germanium but is boron and germanium doped silicon. It is respectfully urged that an alloy of two materials is totally and entirely different from one of the materials doped with the other. They have different chemical compositions, behave in different ways, have different properties

and, specifically, result in different etched substrates with different properties.

On column 7, beginning at line 46, Wu says that the silicon/germanium alloy Si_{1-x} Ge_x where x is always large (i.e. 0.3) be substituted for the heavy boron doping that is part of the prior art. Prior to that statement, in column 7, lines 5-46, Wu requires a graded buffer layer because a jump of greater than about 20 to 25 atoms of germanium creates defects. Column 9, lines 24-33 shows that eliminating the buffer of Wu gives bad results. In Wu samples 100, 110 and 130, the etch stop works because there is a buffer from a small amount of germanium up to the alloy with about 30 % germanium.

Wu states in column 10, lines 50-53 that his silicon-germanium alloys are equal in effectiveness to heavy boron doped silicon. No where does Wu state or suggest that small amounts of germanium could be effective as an etch stop. In point of fact, Wu teaches that small amounts of germanium are etched away to get to the 30% alloy, and that the graded buffer is to prevent defects in the crystal, not to prevent etching. The buffer is etched away.

Wu also shows some substrates are etched when they contain low amounts of boron. Example 130 is such a device. The boron is very low, as is recited in Fig. 1d, of no more than about $4x10^{16}$ cm^{-3} boron near the top of the stack of the graded buffer layer. No where does Wu suggest that an etch stop is possible with heavy boron having a boron content of greater than $7x10^{19}$ cm^{-3} and a germanium content of no more than about $1x10^{21}$ cm^{-3} as recited in the independent claims presented herein.

To read Wu to suggest high boron and low germanium doping is directly contrary to the explicit teachings of the Wu reference that

calls for the direct opposite —low boron doping and enough germanium to form an alloy.

Wu specifically states in the abstract that silicon is etched when the silicon is "any silicon containing less that $7x10^{19}cm^{-3}$ of boron or undoped $Si_{1-x}Ge_x$ alloys with x less than approximately 18." The reference is totally silent about the etching properties of silicon that is doped with heavy boron and about 1% germanium. Wu teaches that the etching properties of the 18% germanium alloys "is attributed to the change in energy band structure by the addition of germanium." This does not happen when the silicon is doped with both boron and 1% germanium. The materials are different in kind.

The Examiner has cited Wu at column 10, lines 20-25 as showing a low concentration of germanium. This is not true if one reads Wu to say that low concentrations are etched away and do not form an etch stop. That is the true reading of Wu. It is respectfully submitted that this is an improper reading of the reference because the reference requires an alloy, does not suggest that the WU_3 is heavy doped with boron and has a graded buffer layer leading to a heavy germanium alloy. Reconsideration of the rejection based on Wu is respectfully urged.

Wu does disclose that silicon has been doped with boron. So have applicants. That is known, and so are the problems of boron doped silicon wafers. Wu eliminates the boron and adds 30% germanium to make an allow. Applicants keep the boron and dope the silicon (for it remains silicon) with about 1% germanium. These two opposite approaches result in two opposite materials. Wu does not disclose silicon doped with heavy boron and 1% germanium and thus cannot be said to anticipate the claims pending in this application. Reconsideration and withdrawal of the rejection is earnestly solicited.

In addition, Wu does not make obvious the present invention under 35 U.S.C § 103. Wu explicitly teaches silicon doped with boron (prior art) or a silicon germanium alloy with at least 18% germanium. To modify this reference by adding only 1% germanium to the boron doped silicon would explicitly contravene the teachings of the reference that says that effective etching is only possible with at least 18% germanium and the silicon is in an alloy form with a changed energy band structure. The most one skilled in the art would do to Wu would (possibly, for the purposes of argument) add 18% germanium to a boron doped silicon to form a boron doped alloy of silicon and germanium. This still is not the present invention.

Applicants independent claims are limited to boron doped silicon which has also been doped with about 1% germanium. Specifically, claims 19 and 28 recite that the silicon have "a germanium content of "no more than about $1x10^{21}$ cm^{-3}" and, in dependent claims 20 and 29 recite that "the germanium content is from about 0.5 $x10^{21}$ cm^{-3} to about 2.0 $x10^{21}$ cm^{-3} ."

The other claims have been rejected on a combination of Wu and two references cited to show specific electronic components such as dielectrically isolated piezoresistors and resonant microbeams (Stemme) or resist shock (Nilsson). Neither secondary reference discloses boron and germanium doped silicon and thus add nothing to the deficiencies of Wu. Withdrawal of the remaining rejections and favorable consideration of the instant claims is requested.

It is respectfully requested that the Examiner consider the amendments and remarks herein, and pass this application to issue. If the Examiner considers this case ready for conclusion, other than by allowance, he is respectfully requested to call Applicant's attorney at the number listed below.

Respectfully submitted,
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DATE: January 21, 2004

By their Attorney

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CERTIFICATE OF MAILING

I hereby certify that the attached correspondence is being deposited with the United States Postal Service and First Class Mail in an envelope addressed to: Commissioner for Patents, Mail Stop amendment with fee, PO Box 1450, Alexandria, VA 22313-1450, on the date appearing below.

DATE: 21 January 2004

Respectfully submitted,

John S. Munday